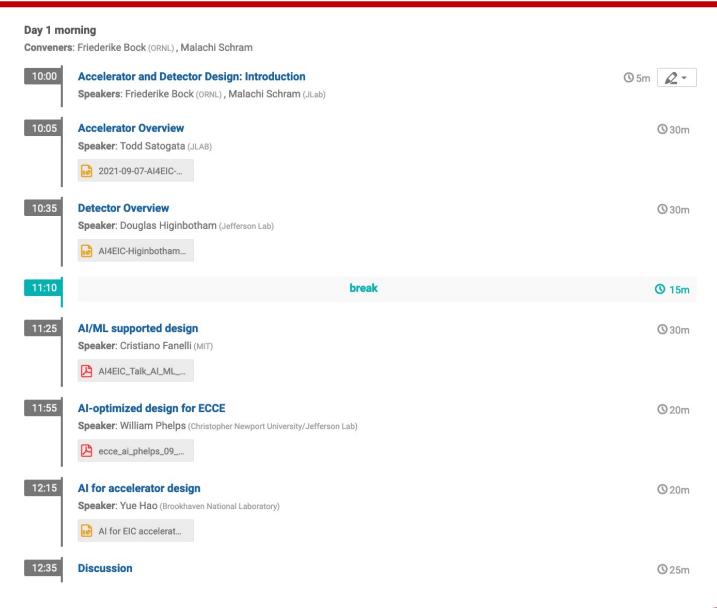
Accelerator and Detector Design: Summary





Accelerator Design for AI4EIC

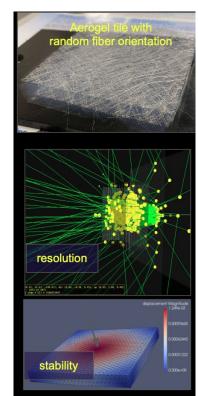
- The majority of the parameters are tightly constrained based on the exiting infrastructure (RHIC tunnel, etc).
- Broader-scope AI/ML adoption in accelerator design is challenging
- Suggests narrow-scope technical design optimization is most acceptable for new methods of optimization
 - Component design optimization and evaluation
 - MOGA techniques helpful for Crab Cavity R&D
 - Develop ML approaches to predict beam lifetime and integrated luminosity
- Some recently started AI/ML studies:
 - Machine tuning using XGBoost, GP, NN
 - Dimension reduction to address large parameter space
- EIC commissioning may benefit from AI/ML techniques being developed now:
 - Development/convergence of high-fidelity commissioning models
 - Develop ML-based noise reduction models for processing large datasets during commissioning
 - Accelerate fault/anomaly identification

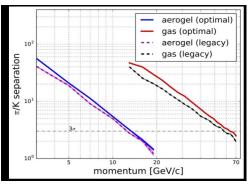
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Detector Design for AI4EIC

- Photo-collaborations are presently working on collaboration proposals: Athena, CORE and ECCE
- Several ongoing AI/ML detector design optimization studies:
 - The ECCE Inner Tracker using MOEA shows improvement over "baseline"
 - Improving mechanical strength of aerogel using MOEA
 - Bayesian Optimization of EIC Dual Rich
- Current optimization studies focus on single system.
 - Generalize tools to accommodate other detectors
 - A multi-dimensional / multi-objective optimization for a global design could be a good next step
 - Increase the effort to make scalable solutions
- New opportunities to contribute:
 - —AIDE (Al for the Design of EIC) at (https://eic.ai/)







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